FINAL REPORT

Expert Consultation on PJM Supplemental Transmission Projects: Standards and Oversight

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List of Abbreviations and Acronyms

PJM Pennsylvania-New Jersey-Maryland Interconnection or PJM Interconnection, LLC

CAPS Consumer Advocates of the PJM States, Inc.

TO Transmission Owner

PC PJM Planning Committee

TEAC PJM Transmission Expansion Advisory Committee

STP Supplemental Transmission Projects

CAPEX Capital cost or Capital Expenditure estimated for a transmission project, specifically a Supplemental Transmission Projects in the context of this report

CA Continuum Associates LLC [Consultant to CAPS for this engagement]

B Used to denote one billion United States Dollars. Equivalent to $1,000,000,000

M Used to denote one million United States Dollars. Equivalent to $1,000,000

CPCN Certificate of Public Convenience and Necessity

NTA Non Transmission Alternatives

CY Calendar Year

OATT PJM's Open Access Transmission Tariff

ROW Right of Way

1. Executive Summary

Continuum Associates LLC (Continuum Associates) was retained by the Consumer Advocates of the PJM States (CAPS) to perform a detailed assessment of planning, approval, and oversight process associated with Supplemental Transmission Projects (STPs) in PJM. The intent of the Continuum Associates' mandate was to perform a detailed and thorough assessment of the PJM planning process as it relates to STPs proposed in PJM. Additionally, Continuum Associates identified the shortcomings with the oversight process associated with STPs, both at PJM and State Commissions that review and approve power transmission projects in their jurisdictions. Finally, Continuum Associates developed recommendations on enhancing and improving the overall oversight for STPs.

Over the past few years, the numbers of STPs proposed in PJM have increased significantly. Based on information collected from PJM's website, the CAPEX of STPs built and commissioned into service in 2013 totaled about $3M. In 2020, the CAPEX of STPs expected to be built and commissioned is expected to be approximately $3.9B, an increase of almost 1,300 times. As the first step of its engagement, Continuum Associates completed an assessment and review of planning standards and guidelines used by PJM TOs to plan and conceptualize transmission projects. This is covered in Section 2 of this report. A comparative assessment of the planning standards is provided in Appendix A of this report.

A thorough assessment of STPs currently proposed and completed in PJM's service territory was completed for all TOs to assess the numbers and CAPEX budget of all STPs proposed in PJM. Data on STPs was collected from PJM's website and further scrubbed and organized to provide insights on different classifications of STPs. This included STPs across different PJM regions, across different PJM TOs, and different types of transmission projects amongst other pertinent categories. This information is presented in detail in Section 3 of this this report and Appendix B provides graphical details on our findings. STPs proposed until the expected in-service year of 2040 were assessed. Section 4 of the report specifically focuses on the STPs that were completed or proposed to be completed in 2018. Appendix C provides further graphical details and illustrations on STPs proposed to be completed in 2018.

Section 5 of the report details the issues with STPs from initial conceptualization to final commissioning. Continuum Associates studied the complete life-cycle of a STP, from conceptual planning to its implementation and realization. Issues and shortcomings with each phase of development of a STP are detailed in Section 5 with particular focus on the issue of lack of oversight.

In an effort to find recommendations to address the issues identified with the overall life-cycle of a STP and the issue of lack of oversight, Continuum Associates completed interviews with State Commissions and Consumer Advocates for PJM states. A summary of findings and issues related to oversight of STPs collected through these interviews is presented in Section 6 of this report. Section 7 details the concrete, impactful, and readily implementable recommendations for the Consumer Advocates and the State Commissions that should be implemented to enhance overt oversight of STPs proposed across the PJM footprint.

2. Review of Planning Standards and Guidelines Used by PJM Transmission Owners for Supplemental Transmission Projects

Continuum Associates completed a comprehensive review of planning standards, planning criteria, interconnection requirements, and other guidelines used by various PJM Transmission Owners for transmission projects. These standards and criteria were specifically reviewed to evaluate how they were or are being applied to study and evaluation of Supplemental Transmission Projects (STPs) proposed by various Transmission Owners within the PJM footprint. The intent of this exercise was not to evaluate the validity of a specific planning criteria and standard as it may apply to the conceptual or final planning of a PJM Supplemental Transmission project or qualitative assessment of a planning criteria being used by PJM TOs for PJM Supplemental Transmission Projects. The intent of this exercise was rather to identify the reasonableness of planning standards and criteria currently in use by different TOs. Reasonableness of planning criteria and standards used by various TOs were assessed to determine if any of them may be resulting in STPs with excessively large scopes of work and capital costs for STPs. Continuum Associates' intent was also to evaluate whether efficient planning practices were being following while planning for STPs.

Appendix A lists a high-level comparative assessment of planning criteria and standards evaluated for various PJM TOs. Since PJM TOs do not differentiate a transmission project based on different categories such as STP or Baseline Reliability, the TO planning criteria evaluated also applies to STPs.

It should be noted that not all TOs publish their planning criteria on PJM's website in sufficient detail to perform a thorough comparative assessment. Planning standards and criteria are also not published in a consistent manner, i.e. not all of them address all aspects of planning across different voltage levels and categories of power transmission equipment such as overhead transmission vs. underground transmission and so on. Some of the TOs only provide a cursory reference to planning standards and criteria that they are using. As an example, some of the TO planning standards just refer to PJM's Manual 14B and NERC planning criteria, such as the NERC TPL TPL-001-4 as a reference for planning their own transmission infrastructure needs, without providing any further details. Considering lack of sufficient details in planning standards and criteria across all PJM TOs, a full and comprehensive comparative assessment between the planning standards cannot be completed as part of this work. It should also be noted that NERC Transmission Planning (TPL) criteria and other standards mentioned or referenced by TOs indicate only the minimum criteria that a TO needs to follow to avoid NERC criteria violation, and does not delve into details of good practices or efficient practices in transmission planning that should be applied. As a result, the NERC planning criteria only establishes a floor or minimum requirements for the purposes of designing and planning power transmission infrastructure. Transmission owners

are not bound by any upper limits or requirements to plan their transmission infrastructure to be capital cost efficient, in line with good planning practices. A Transmission Owner can always plan or engineer its transmission network to a higher benchmark or standard based on its unique needs which it finds reasonable based on its own unique circumstances or customer needs. Such instances cannot be evaluated without performing a deeper and more detailed assessment of a need that may be driving a certain STP and the transmission solution proposed to address that transmission need.

Based on the limited assessment that we could perform for the TO planning standards and criteria, the following are our findings[1].

1. All TOs comply with NERC planning criteria, specifically the NERC TPL TPL-001-4 planning criteria. TOs with a footprint in PJM also specifically comply with PJM Planning Manual 14-B planning standards. Hence, all TOs are adhering to minimum planning requirements.

2. The transmission planning criterial and standards used by PJM TOs are generally consistent across the board for voltages 100 kV and higher. The primary or governing planning criteria in most cases is the NERC Planning Criteria NERC TPL TPL-001-4 and the PJM Planning Manual 14-B, and hence are largely consistent across the TOs.

3. Details – In many instances, TOs provide minimal details on their planning criteria, as is evident from the planning criteria published on PJM's website[2].

4. Inconsistencies in providing the required details pertaining to planning standards and requirements. The TOs have provided minimal to no details on criteria exceptions or deviations from generally accepted standards. Many TOs talk about more stringent planning criteria that they follow under certain circumstances. However, in many instances no details are provided on these more stringent criteria, except for referencing them.

5. Updates – TOs do not appear to be making regular or periodic updates to their standards, as provided to PJM. Some of the TO planning criteria has not been updated in years. For example, Duke Energy last provided an update on its planning criteria in 2011.

[1] Stability criteria used by different TOs was not evaluated as part of our work for CAPS, since the cost of transmission upgrades associated with stability related issues are significantly smaller compared to transmission upgrades required for powerflow related issues.
[2] https://www.pjm.com/planning/planning-criteria/to-planning-criteria.aspx

6. There is little to no PJM oversight or due-diligence on how and when the criteria are being submitted, or what is being submitted as part of the criteria. It appears that PJM does not enforce uniformity or minimum standards on the planning criteria that the TOs are submitting to PJM which are eventually published on PJM's website. TO planning criteria vary significantly on details and frequency at which planning criteria are published.

Our overall assessment of TO planning standards and requirements did not indicate any unreasonable standards. However, as noted earlier comparison of TOs planning standards and requirements cannot establish how reasonably such standards are being applied to STPs being proposed by Transmission Owners. Such assessment of reasonableness can be evaluated only by delving deeper into the details of a particular STP being proposed by a TO and comparison of transmission upgrades proposed as part of a STP with TO published transmission planning criteria. Such an exercise was outside the scope of our current phase of work with CAPS and also needs significantly more concerted effort. As part of recommendations to enhance oversight by the Consumer Advocates and the State Commission staff in section 6 of this report, we recommend that a thorough assessment of STPs being proposed be completed on a regular basis, with emphasis on ensuring that TOs are judiciously and reasonably planning STPs.

3. Status of Supplemental Transmission Projects in PJM Footprint[3]

We performed detailed assessments of all Supplemental Transmission Projects currently proposed in PJM footprint by PJM member TOs. The primary source of this information was the PJM portal. Continuum Associates also performed a scan of TO presentations for Supplemental Transmission Projects presented at the PJM PC, TEAC, and regional sub-committees to get a sense of type, cost, and volume of STPs that have been proposed by Transmission Owners.

Appendix B shows the details of our findings and various metrics on all STPs proposed across the PJM footprint.

Below are the highlights of our findings on STPs that have been proposed in the PJM footprint.

1. Total of 1,094 transmission projects are proposed across all categories, with proposed in-service dates extending into 2040.

2. Total capital cost of 937 projects proposed to be completed by 2040 is $15.7B. Total CAPEX of all projects proposed, over the same period is probably close to about ~ $18.5B - $20B.

3. Average cost of a supplemental project proposed in the PJM footprint, when calculated on the basis of all STPs proposed on the PJM footprint is about $16.8M.

4. There is a significant variety in the STPs proposed based on capital cost:

    a. Largest or most expensive project is a Transmission Hardening Program totaling $1,275B proposed by PSE&G. Expected to be complete by April 30, 2020.

    b. STPs as low as $100,000 are proposed by TOs.

5. Almost 157 proposed projects have no cost allocated to them. No CAPEX has been listed for these STPs on the PJM portal.

[3] Source of Information:
1. PJM Website (https://www.pjm.com/planning/rtep-upgrades-status/construct-status.aspx
2. Other publicly available sources such as meeting material published on PJM committee meeting portals
3. Material published on PJM's regional subcommittee meeting portals
4. PJM TEAC presentations – January 10, 2019 and February 7, 2019

6. Up to an estimated $2.63B[4] in STPs have no CAPEX budgeted, and hence may not be accounted for in total CAPEX ($15.7B) for all STPs. Actual CAPEX for all STPs proposed may be much higher.

Additionally, below is a snapshot of STPs that are currently under construction. The actual in-service date of STPs currently under construction may change as the projects are implemented and more up-to-date information is provided by TOs implementing STPs. The in-service date of STPs listed below is estimated to be between 2019 – 2025 (a six-year time period):

7. Total of 542 supplemental projects are currently under construction.

8. Total capital cost of 542 projects under construction is approximately $8.8B.

9. Average cost of a supplemental project under construction is $17.54M.

10. Actual CAPEX spend is most likely higher since almost 42 supplemental projects have no cost allocated.

11. We estimated that actual cost of supplemental projects under construction may be approximately around $9.51B, after estimating cost for 42 STPs that had no CAPEX cost allocated to them.

In January 2019 and February 2019, PJM presented additional insights on STPs proposed at the PJM TEAC. Below are additional insights from those presentations[5]:

1. By the end of CY2018, the total Supplemental Transmission Projects across PJM footprint topped $26B in CAPEX budget, an incremental increase of over $6B compared to Supplemental Transmission Projects proposed at the end of 2017.

2. 2018 saw the largest increase in Supplemental Transmission Projects at over $5.7B. The second largest set of Supplemental Projects in PJM was proposed in 2015, totaling about $5.1B.

3. Top three TOs proposing Supplemental Projects in PJM in 2018:

[4] Estimated based on the average cost of a STP; Average cost of a STP (approximately $16.8M) * Total number of STPs that have no CAPEX budget allocated on the PJM portal

[5] CAPEX and/ or cost numbers rounded to one decimal place, where applicable

a. PSE&G - $1.6B
b. AEP - $2.4B
c. ATSI - $511M
d. Top three TOs proposing Supplemental Projects in PJM since 2005:
    i. PSE&G - $9.1B
    ii. AEP - $6.2B
    iii. PPL - $3.1B

It should, however be noted that the number and scope of STPs remains dynamic and fluid through the planning and PJM stakeholder process. These projects change in scope and numbers frequently as evident from frequent updates by PJM of STPs on its portal. Hence the number and the total budget of STPs Projects presented as part of this report should be more viewed as an indicator of quantity and trend of STPS that are being proposed. The information presented here should not be used to evaluate merits of individual STPs.

Full details of our findings with graphical illustrations on all STPs proposed and under construction in PJM are provided as part of Appendix B of this report. Information presented here on STPs, currently proposed and under construction in PJM was sourced solely from PJM's portal and is subject to further updates based on periodic information provided by PJM TOs.

4. Supplemental Transmission Projects Planned and Completed in 2018[6]

Continuum Associates collected comprehensive data on Supplemental Transmission Projects that were proposed to be completed and were actually competed in 2018. The source of this data and information was the PJM portal. Extensive scrubbing and analysis on raw data collected from PJM's portal was completed to gain insights on Supplemental Transmission Projects that were proposed and completed in 2018.

Below is a snapshot of data that was collected and analyzed:

1. A total of 362 Supplemental Transmission Projects were proposed and planned to be completed in CY 2018. Total CAPEX for all planned supplements projects was $2.97B

2. A total 114 transmission supplemental projects were actually completed at a total CAPEX of $991.2M

3. Project realization (construction completed) rate for all STPs, on average was approximately 33.4 percent

4. There was a significant and varying variety in the STPs that were proposed and completed in 2018:
    a. Lowest cost supplemental project was $50,000 and involved installing a wave trap at an existing substation. Proposing TO was ComEd.
    b. Highest cost supplemental project was $156 M and involved building a 138 kV substation for four new 138 kV circuits. Proposing TO is PEPCO.

5. In terms of planned STPs, PSE&G had the largest CAPEX allocated to planned STPs at $838M

6. AEP had the second largest CAPEX allocated to planned supplemental transmission projects at $774M

[6] Source of Information:
1. PJM Website (https://www.pjm.com/planning/rtep-upgrades-status/construct-status.aspx)
2. Transmission Cost Information Center (TCIC) (https://www.pjm.com/planning/rtep-upgrades-status/cost-allocation-view.aspx
3. Other publicly available sources such as meeting material published on PJM committee meeting portals
4. Material published on PJM's regional subcommittee meeting portals

7. In terms of realized (construction completed) STPs, AEP realized the highest number of supplemental transmission projects at $26 M, at a realization rate of about 34 percent

8. PEPCO achieved a realization rate of 100 percent, completing construction of all supplemental projects that it had planned, at a total CAPEX of $156M

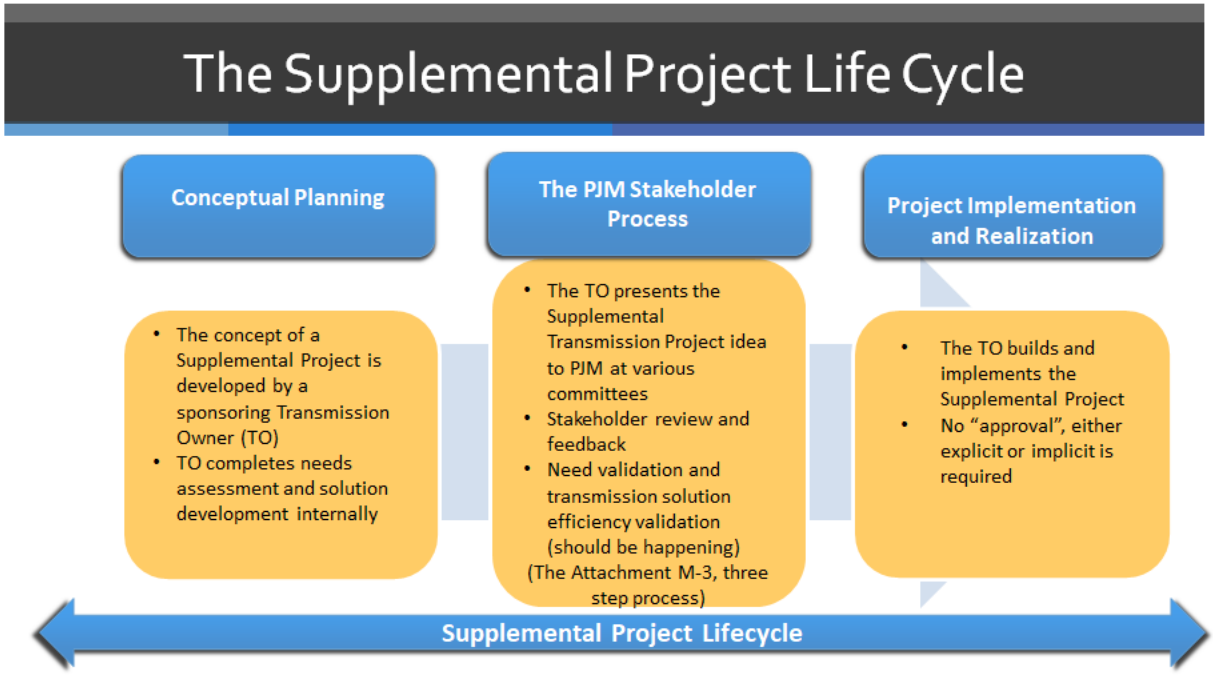
9. PSE&G realized supplemental transmission projects totaling $147M, a realization rate of about 17.5 percent

Full details of our findings with graphical illustrations are provided as part of Appendix C of this report. It should be noted that Continuum Associates could not verify the accuracy of these numbers with actual on-the-ground implementation of STPs. Information presented here was sourced solely from PJM's portal and is subject to further updates based on periodic information provided by PJM TOs.

5. Current and Known Issues with PJM Supplemental Transmission Projects

5.1 The Supplemental Transmission Project Life Cycle

Continuum Associates performed a thorough assessment of the life-cycle of a Supplemental Transmission Project, from the moment it is conceptualized by a Transmission Owner through the PJM stakeholder process and finally when it moves through the implementation or construction process. The overall process can be summarized graphically as shown in Figure 1.



Figur: PJM Supplemental Transmission Project Life Cycle

There were a number of issues that Continuum Associates identified with the life cycle of STPs during the course of our consulting engagement with CAPS. The overall STP life cycle can be broadly divided into the following three high-level steps:

1. Conceptual Planning
2. PJM Stakeholder Process
3. Project Implementation and Realization (construction and commissioning)

In the following section, we detail each of the three steps that complete the life cycle of a STP. Section 4.2 describes the issues with each of these three steps.

1. **Conceptual Planning**

   Conceptual Planning involves developing the concept of a STP based on developing or identifying transmission needs. The sponsoring TO analyzes the needs internally and develops a transmission based solution to the identified needs. The sponsoring TO should be using good utility practices and efficient transmission planning techniques to identify the most cost effective and efficient transmission solution to an identified needs. However, that is not happening uniformly across the board for all the STPs proposed by every TO[7]

2. **PJM Stakeholder Process[8]**

   The PJM Stakeholder process involves the sponsoring TO presenting the STP at various PJM committees and sub-committees. This involves presenting the identified need and the STP to mitigate the identified need at the PJM TEAC and sub-regional committee meetings. This is where significant changes, in terms of adhering to the PJM Tariff for STPs have taken place and have been pursued by PJM. PJM has started enforcing the three-step process and the timelines mandated for each step per the Attachment M-3 of the PJM OATT. However, the PJM stakeholder process still lacks a needs assessment and validation of a transmission solution proposed by a sponsoring TO[9]. PJM currently performs no validation of the need and no assessment of the proposed Supplemental Transmission Solution in response to an identified need. Such an assessment by PJM or another entity, such as the State Commissions or the Consumer Advocates should involve both assessment of efficacy and effectiveness of a proposed transmission solution and assessment of capital costs or CAPEX for the proposed solution. Ideally, this step should also evaluate if a non-transmission solution exists to an identified transmission needs, and if a non-transmission solution is more cost effective than the identified transmission need. More on our recommendations for NTAs is covered in section 6 of this report.

[7] American Municipal Power, Inc. performed an in-depth analysis of some of the Supplemental Transmission Projects proposed by PJM TOs, which indicated inefficient planning involving inadequate use of existing transmission network resources.

[8] Per recent changes to the Attachment M-3 process by PJM, stakeholders now have the opportunity to review assumptions and provide comments on assumptions used during the early planning stages of a STP.

[9] No needs assessment and validation of a transmission solution is performed by PJM or another independent stakeholder.

3. Project Implementation and Realization

Project Implementation and Realization follows the PJM stakeholder process described in step 2 above and involves the implementing and construction of the proposed STP. Per the current OATT, TOs do not need an approval, either explicitly or implicitly from PJM to proceed with the implementation. Sponsoring TOs are also not required to provide any feedback or reporting to PJM or PJM stakeholders once a STP has progressed to the Project Implementation and Realization phase.

5.2 Issues with the Overall PJM Supplemental Transmission Project Life Cycle – From Conceptual Planning to Project Implementation and Realization

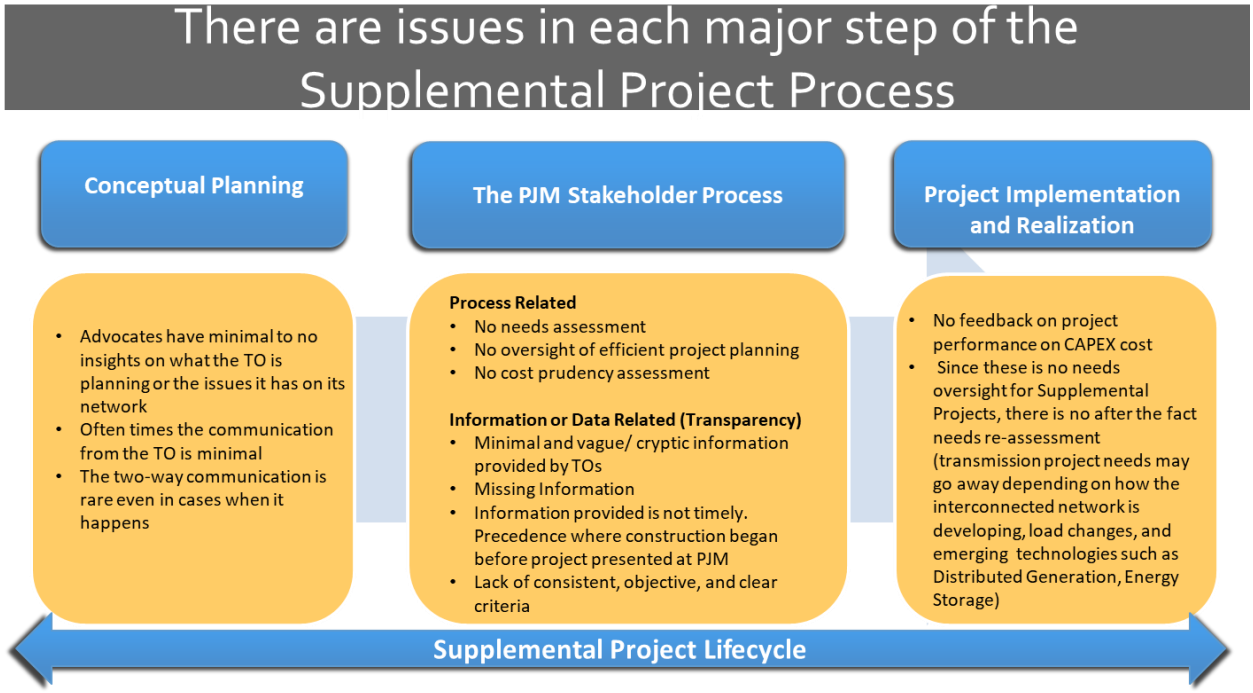


Figure 1: Issues with Supplemental Transmission Project Process

Though PJM has taken some steps to improve the stakeholder engagement for STPs, numerous issues remain with the overall assessment and oversight of STPs. These issues also apply to STPs which were implemented or constructed in 2018. These issues are:

Issues with the transmission project oversight process during Step1 - Conceptual Planning phase:

1. **Lack of insights into STP pipeline**

   Most State Commission staff and Consumer Advocates have little to no insights into the PJM STP pipeline. Though certain states such as Ohio and West Virginia commission staff will have meetings with TOs in their respective states from time-to-time, such meetings are not required by commission statutes and as a result, may not happen regularly and are not obligatory. Such meetings are also not happening uniformly across all PJM member states. In most cases the Commission staff and the Advocates are learning about the STP pipeline during the PJM stakeholder process. This results in lack of oversight into developing transmission needs. It also prevents oversight during initial stages of the transmission planning process for a STP, which is important to determine the scope of work and CAPEX budget of the developing pipeline of STPs.

2. **Minimal Communications during the Conceptual Planning Phase**

   State Commission staff and Consumer Advocates have, in most cases minimal feedback or insights from incumbent transmission utilities during the conceptual planning phase. Such communication should include a snapshot or summary of transmission issues developing in a utility's footprint and a high-level summary of potential transmission solution(s) that can address the identified STP needs.

   In some cases, there may be some communication happening between the sponsoring TO and the State Commission staff, but such communication is rare, irregular, and not procedurally required.

Issues with the transmission project oversight process during the PJM Stakeholder process and during assessment by State Commissions and State Consumer Advocates:

1. **No independent needs assessment**

   Currently there is no transmission needs assessment being performed for STPs by an independent authority such as PJM. Per the PJM tariff, PJM is not required to perform any needs assessment for STPs and PJM currently performs no need assessment for STPs. Similarly, if a STP needs no Certificate of Public Convenience and Necessity (CPCN), it is likely to have no regulatory oversight at the State Commission level. As a result, STPs needing no CPCN will have no need assessment performed to assess the need of the transmission project during its entire life cycle, from concept to completion. Therefore, a significant number of STPs reach the project construction or implementation phase without

any independent needs assessment. The only project needs assessment that is being performed in such cases is performed by the Transmission Owner sponsoring the project.

2. Limited assessment of transmission solution options

A comprehensive transmission solution assessment and solution development should involve rigorous assessment and testing of transmission solutions that may address an identified transmission issue or need. Though some limited needs assessment is being performed by a sponsoring transmission owner, it is not fully clear (or transparent) that a comprehensive assessment of all possible solutions is being performed by the sponsoring transmission owner. Such an assessment is important to identify the most cost effective and cost efficient STP to an identified need for a STP. Though Continuum Associates did not perform a deep-dive review on how and to what extent sponsoring TOs are performing assessment of transmission solutions to a particular need, we did find instances where stakeholders such as AMP found lower cost alternatives to a specific transmission solution that the TO was proposing to pursue. We believe that this may be an indication that TOs may be performing only a limited assessment of transmission solution options to a particular transmission need. Additionally, there may be instances where a lower cost or more efficient solution may exist to a particular transmission need, but has not been pursued or evaluated by a transmission project sponsoring Transmission Owner. And as mentioned previously in this report, since PJM is not performing any independent needs assessment of STP, a comprehensive and thorough assessment of transmission solution options may be lacking for a number of STPs.

3. No or minimal transmission project cost prudency assessment

Transmission project cost prudency in the context of STPs involves ensuring that the least cost transmission project that addresses the transmission need is proposed and pursued for implementation. It is an iterative process requiring costing each transmission solution that can address specific needs that have been identified and a comprehensive cost-benefit analysis of each viable and effective solution. Ultimately, the iterative exercise should result in the lowest cost transmission solution that addresses a specific transmission needs. Since none of the STPs undergo a rigorous needs assessment or solution assessment at PJM, such cost prudency is not being done by PJM staff when the project is presented to PJM. If the STP needs no CPCN, no cost prudency is being done by the State Commission staff either. During our interviews with the State Commission and Consumer Advocates staff, lack of transmission project cost prudency was repeatedly highlighted as an issue. Transmission project cost prudency in this context also means that the CPAEX cost of a STP is accurately

estimated, and neither overestimates or underestimates. State Commission and State Advocates repeatedly indicated lack of or absence of in-house expertise within their organizations that can perform thorough cost prudency assessment of transmission projects.

4. Transparency related issues:

There are a number of transparency related issues with the current PJM Stakeholder Process:

a. Minimal and vague information provided by project sponsors (incumbent TO proposing the project)

This primarily involves limited information provided by a TO for a STP in many cases during the PJM stakeholder process. Even in cases where the information is provided, it may be vague preventing a stakeholder from fully understanding the issue that a TO is trying to resolve and the solution that is being proposed. We found that in many cases, the TOs are presenting very limited information during the PJM stakeholder process, thereby limiting comprehensive understanding of the needs that a proposed STP is addressing.

b. Missing information

During our due diligence, we found instances where not all the pertinent information was being presented for a STP by the sponsoring TO. In many cases, only high-level information for a STP was being presented for both the transmission solution and the transmission need. Lack of all pertinent information from the sponsoring TO for a STP prevents thorough due-diligence of a STP during the PJM stakeholder process.

c. Lack of up-to-date information and not following the Attachment M-3 process

There have been instances where the STP related information presented by a sponsoring TO, was either not up-to-date or did not follow the right order of pursuing a STP through the PJM stakeholder process, the Attachment M-3 process. There are known instances where a STP was presented by the sponsoring TO after engineering and design had begun on the STP or the STP was ready to proceed to implementation, indicating completion of engineering and design. This is not in line

with the intent of PJM's Attachment M-3 process, according to which PJM Sub-regional RTEP Committees should have an opportunity to provide comments on assumptions, methods, system needs, and potential transmission solutions for a STP. Per the Attachment M-3 process, the PJM Sub-regional RTEP Committees should have a meaningful opportunity to participate and provide comments and feedback thorough the entire planning process for a STP[10].

d. Lack of consistent, objective, and clear planning criteria

As noted in Section 1 of this report and Appendix A of this report, a number of TOs do not provide clear, concise, and comprehensive planning criteria for their transmission projects. Transmission criteria provided by TOs and published on PJM's website varies from a single page to tens of pages. At this time, it also appears that PJM is not requiring its member TOs to provide a consistent set of planning criteria which can be used by stakeholders to evaluate a STP in a uniform manner.

5. No assessment of non-transmission alternatives (NTAs)

Based on our review of STPs presented at various PJM committees and forums, our understanding is that the TOs are currently performing no non-transmission alternatives solutions assessments for an identified need requiring a transmission solution. Certain type of needs for STPs such as those feeding non-networked loads at the end of long radial transmission lines, critical loads requiring second or third feed for high redundancy, and loads in densely populated urban areas where building transmission is difficult may be good candidates for NTAs. NTAs may be easier to implement, more cost effective, and lower in cost in such situations. However, such assessment is currently either not being performed at all or not being performed in earnest for serious consideration.

Issues with the transmission project oversight process during the STP Implementation Phase:

1. Little to no feedback on efficient implementation of a STP

Currently, TOs are not required to report their performance on the implementation of a STP, i.e. a TO is not required to report on its performance on implementation metrics such as cost and schedule. This prevents the Consumer Advocates or the PJM stakeholders from

[10] Attachment M-3: Additional Procedures for Planning of Supplemental Projects; PJM Open Access Transmission Tariff

knowing how well a STP is being implemented by a sponsoring TO. However, we note that this is a wider industry issue and is not limited to PJM STPs.

2. **No after-the-fact reassessment and assessment of non-transmission alternatives:**

   There is no periodic re-assessment of need for a STP. Such a re-assessment would generally happen before a STP begins construction and may apply only to larger STPs with longer gestation periods. A final re-assessment may reinforce the need for a STP and also ensure that the proposed transmission solution continues to be the most appropriate solution, in case there is a change in the scope and need for a STP.

5.3 Issues and Challenges with Planning and Implementation of Supplemental Transmission Projects, Specifically Applicable to Consumer Advocates and State Commission Staff

To fully understand the issues of regulatory oversight for STPs, it is also important to understand some of the challenges that the State Commission staff and Consumer Advocates currently face with performing oversight for transmission projects. During the course of our assessment of current oversight mechanisms in place at State Commissions and Consumer Advocates for STPs, we identified a number of systemic and structural issues with the oversight required for STPs and their planning. These issues specifically impact the Consumer Advocates and the State Commission staff due to the nature of these issues and their interaction with the structure of the Consumer Advocates and State Commissions. These issues were identified during our discussions and interviews with the State Consumer Advocates and State Commission staff. Below is a summary of these additional issues:

1. **Technical challenges with thorough evaluation of transmission projects, including STPs**

   Transmission planning process is technically challenging and requires diverse skill sets, currently not in place at most State Commissions or Consumer Advocate offices. Similarly, project costing and estimating skills are also lacking within the State Commission and Consumer Advocate organizations.

2. **Resource Constraints**

Most State Commission staff and Consumer Advocates are resource constrained and lack sufficient staff strength to perform a full and thorough oversight and due-diligence of STPs that are being presented at PJM committees. In the past few years, as also shown in the data presented in Appendix B and C, the numbers of STPs have increased significantly further worsening the situation of resource constraints at various State Commissions and Consumer Advocates. In states where the number of STPs has increased significantly over the past few years such as Ohio, Virginia and New Jersey (amongst others), Consumer Advocates have not been able to keep up with oversight related workload.

3. Lack of Overt Regulatory Oversight

Some states such as New Jersey and Indiana require no CPCN for power transmission projects. Hence in such states, under certain circumstances, a STP may have no overt oversight project at all. Certain other states such as Michigan have a higher threshold for transmission projects at 345 kV and hence may have rather limited or no oversight for STPs, which in many cases tend to lower voltage at less than 345 kV.

6. Interviews with State Consumer Advocates Staff and State Utility Commission Staff

Continuum Associates reached out to Consumer Advocates for all 13 PJM member states and District of Columbia to understand any statute or regulations in place, which gives the Consumer Advocates an opportunity to participate in the regulatory oversight of Supplemental Transmission Projects proposed in PJM's footprint. At the suggestion of CAPS, Continuum Associates also reached out State Commission staff for the 13 PJM States and District of Columbia to identify and understand specific statutes in the public utilities laws in the respective states which gives the ability to the Commission staff to have regulatory oversight of Supplemental Transmission Projects.

Below is a summary of our findings from our outreach with the Commission State and Consumer Advocates staff:

Comments and Feedback on Oversight for STPs	Applicability
On statutory regulations governing Supplemental Transmission Project in PJM Footprint	
1. States do not have statutory regulations that apply specifically to Supplemental Transmission Projects. Transmission Projects are not differentiated or categorized based on the nature of need that they are trying to address. As a result, there is no differentiation between Baseline Reliability Transmission Project, Supplemental Transmission Project, or another category of transmission projects.	Applies to all states. No exceptions.
2. States depend on the Certificate of Public Convenience and Necessity (CPCN) process to regulate transmission projects, including Supplemental Transmission Project. Other than the CPCN process, there is no other statutory regulatory mechanism through which the States perform oversights of STPs, specifically the need for STPs.	Applies to all states. Exceptions are Indiana and New Jersey which do not have a CPCN requirement for transmission projects

Comments and Feedback on Oversight for STPs	Applicability
Oversight Process	
1. In general, both State Commission and Consumer Advocates make good effort to keep track of Supplemental Transmission Projects, where possible. The primary mechanism through which such an oversight is provided is the need for a CPCN in cases where a transmission project meets or exceeds thresholds for a CPCN. Transmission projects that do not need any CPCN may have no overt oversight. The only exception to this may be cases where the Commission is approached to provide zoning exemptions for transmission projects traversing multiple towns and counties within their states.	Applies to all states
2. State Commissions and Consumer Advocates depend on the PJM stakeholder process undertaken through various PJM committees and sub-committees as the initial oversight mechanism. The PJM stakeholder process also serves as the initial and in some cases the only mechanism through which Consumer Advocates and State Commissions learn about the STPs proposed in their respective states.	Applies to all states

6.1 Regulations Used by Different PJM States for Oversight of PJM Supplemental Transmission Projects

None of the PJM States use specific statutory regulations that apply only to PJM Supplemental Transmission Projects. No overt regulations exist within PJM States which may be specific to Supplemental Transmission Projects. State statutes make no differentiation of transmission projects based on the need or the issue that they address such as baseline reliability, supplemental, or network projects. State regulations generally apply to transmission project and the extent of regulatory reach is determined by the scope of the project including length (length of a transmission line in miles), voltage level (69 kV and above, 100 kV and above, etc.), the need for

green field development (a new ROW or expansion of an existing ROW), and in some cases the extent of additional infrastructure (number of new transmission poles and so on).

The only regulations through which the PJM States have regulatory oversight of transmission projects, including Supplemental Transmission Projects is the Certificate of Public Convenience and Necessity (CPCN). The need for a CPCN is the only threshold through which PJM member states have regulatory oversight over a transmission project. Transmission projects which do not need a CPCN for any reason currently have no state-level regulatory oversight.

6.2 Policies and Methods Used for Oversight of PJM Supplemental Transmission Projects.

Most State Commissions and Consumer Advocates engage with PJM committees and sub-committees on as needed basis. In many cases, there is also some engagement with TOs, but that is limited and not regular. Below are our findings on how State Commissions and Consumer Advocates are currently undertaking oversight of PJM STPs.

1. State Commission and Consumer Advocates regularly call into PJM TEAC and sub-committee meetings such as Sub-regional RTEP Committee meetings to keep abreast of developments of transmission infrastructure in their states.
2. Commission staff depends on Organization of PJM States, Inc. (OPSI) and the consultant(s) hired by OPSI to keep them updated on transmission related issues at PJM, which may also include issues relates to STPs.
3. Certain states such as Kentucky and Ohio have close cooperation between the State Commission and the Consumer Advocates where both parties collaborate on issues related to transmission development and filings for transmission projects by the incumbent TO.
4. Our discussion with Kentucky and Illinois highlighted the active involvement of Consumer Advocates where they both educate and advise the Commission staff on issues related to transmission development and vice-versa. Consumer Advocates also have a precedence of intervening in CPCN proceedings from time to time.

Additionally, in talking with the State Commissions and Consumer Advocates, most of them highlighted limited resources within their organizations to perform thorough oversight of transmission projects. Except for a handful of State Commissions such as Ohio, most State Commission do not have adequate technical and engineering staff or resources that specialize in utility transmission planning and cost estimation of utility transmission infrastructure. In such cases, the Commission staff mostly depends on PJM's ability, as the regional transmission

organization to provide such expertise which can be utilized during needs assessment of transmission projects. Such an arrangement and delegation of responsibility would generally work well in cases where PJM is providing a more thorough due-diligence. But in the case of Supplemental Transmission Projects where PJM is not performing any needs assessment or due diligence of the underlying needs of a transmission project, there is a strong possibility of no need assessment or due diligence ever being performed. This is especially true of a Supplemental Transmission Projects that fall under the threshold of a CPCN in a respective state.

7. Improving Oversight of PJM Supplemental Projects

7.1 Methods to Improve Oversight of Supplemental Transmission Projects

In this section we identify specific methods and steps that need to be incorporated to enhance and improve oversight of STPs. These methods are specific to the State Consumer Advocates and the State Commission staff. Our overall approach to implementing methods and steps to improve oversight is two-pronged:

1. Short-term improvements that can be implemented immediately to provide prompt oversight improvements

2. Medium-term to long-term improvements that are more profound and should be or can be implemented only over a longer period or systemic improvement which are required to make the oversight process more sustainable. Medium-term to long-term improvements are also required to meet the overall long-term objectives of the State Commission staff and Consumer Advocates

A. Short-Term Improvements

Figure 3 below provides a summary of short-term improvements that should be made to each of the three main steps of the STP life cycle to enhance oversight. Detailed descriptions of our recommended improvements are provided following Figure 3.

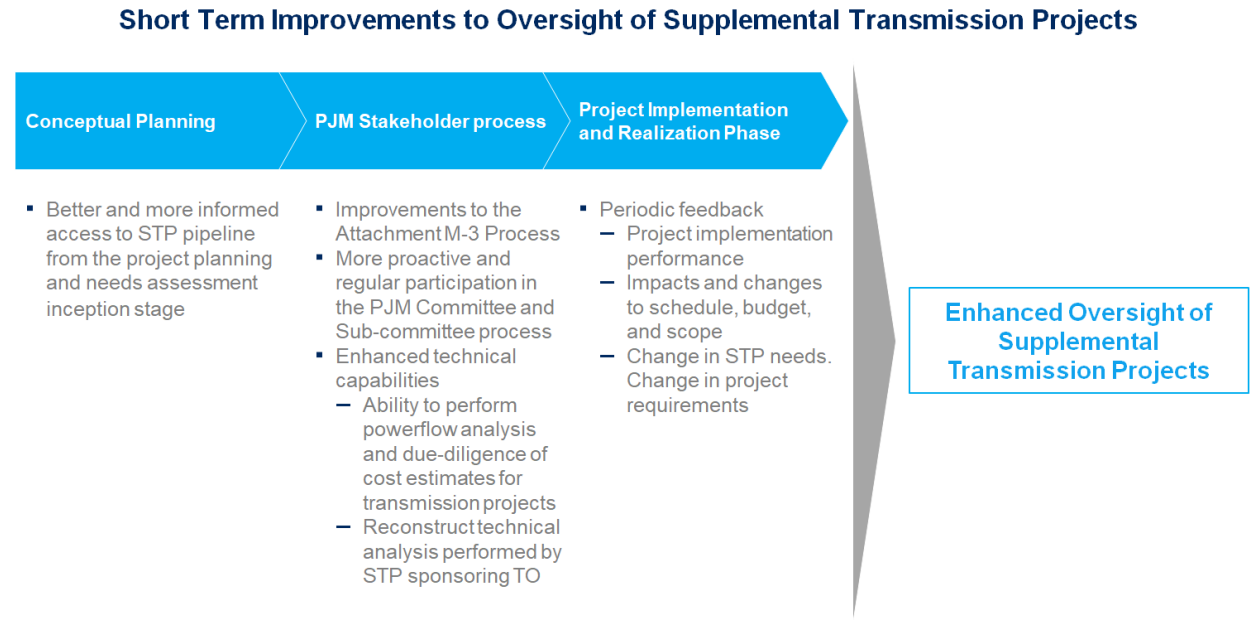


Figure 2: Short-term improvements to enhance oversight of Supplemental Transmission Projects

1. Periodic and on-going access to STPs from the conceptual stage

The Consumer Advocates and the State Commission staff need to have better, on-going access, and more periodic interaction with their TOs to learn about the Supplemental Transmission projects as soon as they are planned or conceived. This will avoid the information asymmetry that the Consumer Advocates and the State Commission staff currently have. Under the currently unstructured process, most Consumer Advocates and State Commission staff either learn about a STP when it has been presented during various PJM stakeholders at the PJM Stakeholder process or when the sponsoring TO approaches the State Commission for regulatory approval for a CPCN. There are few instances where the State Commission staff will learn about a proposed transmission project early on in the planning process, but such instances are rare and do not happen consistently across all states or for all STPs.

Some of the resources that the State Commission staff and the Consumer Advocates can use to proactively learn about STPs, early in the planning process include:

- Integrated Resource Plan (IRP), which a sponsoring TO may publish from time-to-time.[11]

[11] Not all TOs do or are required to publish their IRPs. Some of the states where IRPs are filed regularly include West Virginia and Kentucky.

- Annual Transmission Plans – These may include insights on a utility's transmission development plans over a five, ten, or a longer period of time.

- Rolling Transmission Plans on Planned and Proposed Projects – These may provide details on transmission needs and possible transmission solutions.

- Periodic Meetings with presentations – to discuss transmission needs, solutions, and cost of various solutions.

2. Improvements to the PJM Stakeholder Process

The PJM stakeholder process for STPs has made some improvements pertaining to compliance of the overall stakeholder process with the PJM OATT, however there are still number of shortcomings in the overall due-diligence of STPs. The Attachment M-3 process is good in intent in its current form and PJM is undertaking efforts to ensure that the PJM stakeholder process follows the Attachment M-3 process. However, our assessment is that the Attachment M-3 process is currently not being followed in spirit and more efforts are required from PJM to enforce compliance with Attachment M-3 process. Some of this effort by PJM is currently underway.

The other issue with PJM stakeholder process from the Consumer Advocates and State Commission staff perspective is irregular and inadequate participation in the stakeholder process. Though some of the Consumer Advocates and State Commission staff regularly participate in the PJM committee and sub-committee process, many are not able to. This can be attributed to lack of internal resources to undertake adequate and regular committee and sub-committee participation and in some cases lack of access to technical skills or staff to comprehensively participate in the PJM stakeholder process. Our recommendations to improve the PJM stakeholder participation process by Consumer Advocates and State Commission staff include:

- Proactive participation in the SRTEP, RTEP, and other PJM Committee Processes, with a sharp focus on assessment of STP needs and STP solutions being proposed.

- The Consumer Advocates and State Commission staff will need to enhance their technical capabilities significantly to productively participate in the three-step Attachment M-3 Process at the various PJM committees.

3. Mitigating Resource constraints and enhancing technical due-diligence capabilities

In terms of enhancing or developing technical capabilities, we recommend this effort be undertaken in a centralized manner by CAPS rather than by individual Consumer Advocates. The following skill sets should be developed as part of this short-term improvement recommendation:

- Full Transmission Planning needs evaluation and assessment capabilities. This capability has to be fairly comprehensive to the extent where CAPS or a consultant supporting CAPS can fully interpret the technical analysis that the TOs are presenting and recreate the powerflow results if the need be

- Develop cost estimation capabilities to develop high-level cost estimates (+/- 30%) for TO proposed transmission upgrades

Developing these skills in-house at CAPS through hiring full-time staff may be expensive and inefficient. Initial work load may not be consistent and sufficient to justify hiring full-time technical staff. A more efficient approach may be to engage a qualified consultant to transmission planning and transmission cost estimation capability and transition to full-time employees as and when the workload justifies it.

4. Improvement to the oversights during the project implementation phase

Currently, there is no mandatory feedback required to be provided to Consumer Advocates, State Commission staff, or to PJM once a STP has progressed beyond the stakeholder committee process and into the implementation phase. The transmission planning function is very dynamic in nature. Additionally, the dynamics of the electric power grid in terms of transmission needs and transmission projects being proposed change frequently. Considering such a scenario, we recommend a feedback loop to Consumer Advocates and the State Commission staff on a periodic basis, once a STP has progressed to implementation phase. Such information based feedback loop will provide updates to Consumer Advocates and State Commission staff on any changes in the needs for the STPs and any changes to the scope and budget of the STPs due to change in needs for the STPs.

B. Medium-Term Improvements and Long-Term Improvements

Medium-Term and Long-Term improvements primarily involve structural and systemic changes that need to be made to the overall STP oversight process from conceptual planning to implementation process. These structural and systemic changes would help achieve many of the objectives of transparency, more stringent oversight, and efficient transmission system planning in line with the objectives of the State Commissions and Consumer Advocates.

Below are recommendations to implement structural and systemic changes to the overall STP oversight process. These recommendations are targeted at PJM, State Commissions, and the Consumer Advocates:

1. Thinking outside the "Transmission Box"

Building additional transmission to address transmission system need is, in most cases the most cost effective solution. But this may not be true in all situations. Over the past few years, new and emerging technologies such battery storage, distributed generation, micro or mini grid, active and passive demand side management, collectively known as Distributed Energy Resources (DERs) have shown to provide a lower cost and equally reliable solution as a transmission solutions in some cases. This may be particularly true in cases where incremental power capacity is not significant or the transmission upgrade is required to serve a limited number of customers such as at the end of a radial transmission line or an isolated load pocket. In industry parlance, evaluation of DERs as an alternative to transmission solution is known as Non-wires Alternatives (NWA)

Some of the State Regulators such as the Massachusetts Department of Public Utilities (MADPU) require utilities to evaluate NWAs to a competing transmission need to ensure that the most cost-effective and efficient solution per the ratepayer's needs is selected. We recommend that evaluation of NWA be incorporated into the needs assessments that State Commission staff undertake for a STP.

2. Enhancing oversight for STPs through change in regulations [will require legislative interventions and changes]

During the course of our work for the CAPS, it was amply clear that some of the States lack overt oversight for STPs. New Jersey and Indiana are prime examples of this. Both New Jersey and

Indiana do not require CPCN for electric transmission project. In West Virginia, A CPCN is not required for extension of transmission projects that are classified as “extension during normal course”. Other states such as Michigan do not require CPCN for transmission voltages less than 345 kV. Most STPs, due to the type of transmission needs that they mitigate are likely to be less than 345 kV and hence may not need CPCN in states with higher CPCN voltage thresholds. We recommend that States undertake a thorough assessment of their CPCN requirements and thresholds, and make suitable change to state regulatory statutes to enhance overt oversight of transmission projects.